

measurements often shows recent contact with gonadotoxic agents.

Worker reproductive history is monitored by a questionnaire. This method involves retrospectively computing a standardized fertility ratio (SFR) derived from data on national birth probabilities. The SFR describes fertility before, during and after gonadotoxic exposure and differences are identified between exposed and nonexposed groups. A major advantage is its essentially noninvasive nature: questionnaire responses are limited to psychologically benign factors such as marital status, date of marriage and number, age and sex of children. Levine and colleagues have validated this method among workers exposed to dibromochloropropane and concluded that the questionnaire technique would have identified damage to the male reproductive system a number of years earlier than did the sperm count method.

Both methods generate valuable screening and evaluation data. The major difference is that the sperm count method is more useful for identifying recent gonadotoxic exposures, whereas the questionnaire approach provides a retrospective picture of male reproductive system damage. Both methods, however, provide useful tools for assessing the gonadotoxic potential of a workplace.

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Silicosis and Cancer Risk

ALTHOUGH THE ASSOCIATION between asbestos exposure and lung cancer has been well documented, silica exposure has not generally prompted concern about the excess risk of lung cancer. Recent evidence from both epidemiologic investigations and studies using animals has stimulated renewed interest in this association.

The findings of several studies of miners and foundry workers suggest that they have an excess risk of lung cancer. Those with relatively heavy exposure, such as furnace bricklayers and fettlers, appear to have the highest risk of excess lung cancer deaths. The specific role of silica is difficult to interpret, however, in that foundry workers are exposed to several potentially carcinogenic agents, such as polycyclic aromatic hydrocarbons (PAH), other organic compounds and metals such as lead, chromium and nickel. Some recent data suggest that there may be a synergistic interaction between silica and PAH in increasing the risk of lung and urogenital cancer. There is one group of workers, Vermont granite workers, who have a relatively isolated exposure to silica dust. Data from a 30-year cohort study of mortality in these workers suggest a slight but not significant increase in the incidence of cancer of the respiratory and gastrointestinal tracts and prostate and no relationship between amount of silica exposure and cancer risk.

Recent studies in animals suggest that silica alone may be a carcinogen. It appears that lifetime studies may be necessary to show tumorigenesis; perhaps this is why the association between silica and cancer has not been appreciated in earlier studies of experimental silicosis. Adenocarcinomas and squamous cell carcinomas have been induced in rats after either inhalational exposures or intratracheal instillations. Histiocytic tumors have been induced in rats by intrapleural inoculation of silica, which has also been found to act as a cocarcinogen with benzpyrene.

In summary, then, if there is an increased risk of lung cancer from silica, the risk is probably small and will be very difficult to prove conclusively. Important confounding variables in epidemiologic studies include smoking history, the concomitant presence of nonmalignant respiratory tract disease and occupational exposure to other dusts and carcinogens. Though studies in animals suggest that silica may be a carcinogen, there is a long latency, relatively heavy exposure may be necessary to elicit tumorigenesis and species specificity may be significant. Whether silica acts as a carcinogen alone, as a cocarcinogen or in some other capacity to enhance the risk of lung cancer remains to be determined. As new data emerge, evaluation of silica exposure standards may need to take into account the role of silica exposure in lung cancer risk.

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Surveillance of Hospital Personnel Exposed to Cytotoxic Drugs

MANY CYTOTOXIC DRUGS have been shown to be carcinogens or mutagens. In recent years, there has been a pronounced increase in the use of cytotoxic agents in treating cancer patients and, infrequently, patients with collagen diseases and psoriasis. In some patients who have had cytotoxic therapy, new malignant tumors have developed. Exposure to these drugs may prove to be occupationally health-hazardous in the case of certain hospital workers. Hospital pharmacists are involved in handling and preparing cytotoxic drugs, nurses and physicians in their administration and housekeeping staff in disposing of drug residues and products.

A few studies have been conducted relating chronic daily exposure to small amounts of these drugs to possible mutagenic or carcinogenic effects in the population at risk. Two methods have been used in assessing exposure to the cytotoxic drugs. First, the measurement of mutagenic activity in urine and, second, chromosome analysis for sister chromatid exchange and other chromosome aberrations of peripheral lymphocytes. Most studies indicate that personnel who were exposed to cytotoxic drugs had a greater number of chromosome abnormalities and increased sister chromatid exchanges or an increase in urine mutagenic activity.

Although these methods of assessing exposure to cytotoxic drugs have their limitations, and while better surveillance